

The effects on performance of out-wintering replacement heifers in a high-output dairy system

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Abstract

Out-wintering replacement dairy heifers is commonly practised among low input pasture-based dairy systems, and is potentially an option to facilitate expansion for high output dairy farms. The effects on performance of Holstein dairy heifers out-wintered on perennial ryegrass, fodder beet, or housed during the winter of 2013/2014 in the UK were examined. Forty eight, 23-(± 2.8) month-old, in-calf heifers were randomly assigned to one of three treatments: out-wintered on perennial ryegrass and grass silage (G); out-wintered on fodder beet and grass silage (F); or housed and fed grass silage and concentrate (H). The study commenced in November 2013, with heifers continuing on their respective treatments for 13 weeks, before being housed for six weeks before parturition. Post-partum all animals received the same diet with performance measured for 12 weeks. Mean live weight (Lwt) and body condition score (BCS) during the winter was unaffected by treatment, but BCS of heifers that received G tended to be lower ($P=0.090$) at housing. Post-partum, mean Lwt was unaffected by treatment; however, mean BCS was lower ($P=0.022$) in animals that received G. Milk yield was not affected by treatment, but milk fat (g kg^{-1}) was lowest ($P=0.027$) and milk protein (g kg^{-1}) highest ($P=0.026$), in F. The results indicate that Holstein heifers can be successfully out-wintered without impacting on first lactation performance in a high output dairy system.

Keywords: heifer, out-wintering, forage crop, lactation

Introduction

Out-wintering is the practice of rearing cattle outside during the winter period (Barnes *et al.*, 2013). Out-wintering systems commonly use pasture or a forage crop, such as kale (*Brassica oleracea*) or fodder beet (*Beta vulgaris*) grazed *in-situ* (Atkins *et al.*, 2014). These systems have the perceived advantage of lower costs and improved animal health and welfare (Atkins *et al.*, 2014; Barnes *et al.*, 2013). Potential exists for herd expansion, without high capital expenditure in housing, by employing these systems to rear replacement dairy heifers. However, there are increased risks involved with outwintering cattle (Barnes *et al.*, 2013), in particular to the soil and environment, but also potentially to animal health, welfare and production, which could impact on dairy farm productivity. Reduced animal performance as a heifer through the winter has been reported to have negative effects on productivity and longevity (Le Cozler *et al.*, 2010). Previous research in intensively grazed spring-calving cows (Keogh *et al.*, 2009), and heifers (Kennedy *et al.*, 2012), has reported lactation performance from out-wintering systems similar to that from winter housing. However, the suitability of these systems for high output dairy systems, which require higher live weight gain as a heifer and greater milk production than spring-calving, grazed pasture-based herds, has not been studied. The objective of this study was to examine the effects on early lactation performance of Holstein dairy heifers out-wintered on perennial ryegrass, fodder beet, or housed during the winter of 2013/2014, in the UK.

Materials and methods

Forty eight, 23-(± 2.8) month-old-Holstein heifers, expected to calve between February and April 2014, were blocked according to their predicted transmitting ability (PTA), for milk, milk fat and protein PTA, calving date, live weight (Lwt), and body condition score (BCS), and randomly allocated to one of the

three treatments: out-wintered on strip-grazed fodder beet and bale silage (F), out-wintered on strip-grazed perennial ryegrass (*Lolium perenne*), and bale silage (G), or housed for the winter on bale silage and concentrate (H). During the final two weeks of the out-wintering period, G was offered 1.1 kg DM head⁻¹ day⁻¹ of concentrate due to continuing wet weather. The experiment commenced on 1 November 2013, with the out-wintered groups receiving a fresh strip of forage and 1/3 of dry matter intake as bale silage each morning from 8:00 am, and group H receiving daily concentrates and fresh forage as required. The animals remained on their respective treatments until approximately 6 weeks prior to their expected calving date and were then housed on dry cow total mixed ration (TMR) until calving. Post-partum the animals were housed in a cubicle shed and offered *ad libitum* TMR for the first 12 weeks of lactation. Through the out-wintering period, pre- and post-grazing herbage mass were measured weekly using five, 1×1 m and five 0.4×0.25 m quadrat cuts for fodder beet and perennial ryegrass respectively, and animals were weighed and body condition scored at intervals of two weeks until housed. Post-partum, animals were weighed and body condition scored within 24 hours of calving and at intervals of two weeks until week-12 of lactation, while milk yield was automatically recorded daily in the parlour and samples taken every two weeks for milk fat, protein and somatic cell count (SCC) analysis (NML, Wolverhampton, UK). Daily Lwt change for each animal was calculated by linear regression and data analysed by ANOVA in Genstat v.16.

Results and discussion

The mean herbage mass of fodder beet during the out-wintering period was 19.9 (±2.19) Mg DM ha⁻¹ with mean utilisation of 81.3% (±14.0). Mean herbage mass in perennial ryegrass fields was 3,460 (±459) kg DM ha⁻¹ pre-grazing and 1,960 (±389) kg DM ha⁻¹ post-grazing. Calculated mean group intakes for F were 7.3 (±2.02) kg DM of fodder beet and 3.6 (±1.10) kg DM of silage; for G, 6.0 (±2.17) kg DM of perennial ryegrass and 4.5 (±1.12) kg DM of silage; and H, 8.5 (±1.85) kg DM of silage and 1.0 (±0.22) kg DM of concentrate per day.

The mean number of days spent on each treatment during the out-wintering period was 91 days, which did not differ between groups ($P=0.928$), nor was the number of days spent housed on transitional dry cow TMR different ($P=0.633$), at 44 days on average, close to the target of 6 weeks prior to calving. At parturition there was no difference in Lwt ($P=0.390$) between treatments (Figure 1); however, daily Lwt change was lower ($P=0.001$) during the out-wintering period for G than F or H; 1.24, 0.95 and 1.11 kg head⁻¹ day⁻¹ for F, G and H respectively. Body condition score tended to be lower in G at housing ($P=0.090$) and was lower ($P=0.022$) during lactation for G than F or H; 2.63, 2.44 and 2.61 BCS for F, G and H respectively. This was not reflected in lower milk yields, which were the same across all treatments

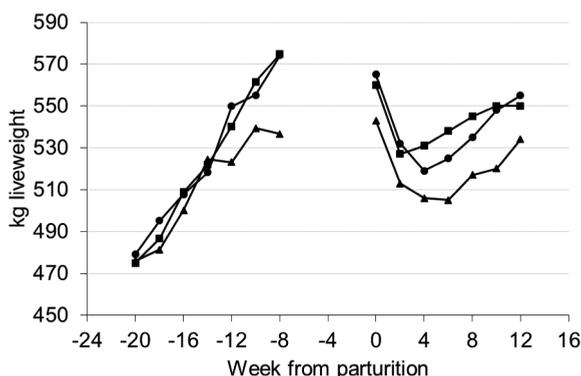


Figure 1. Live weight of Holstein heifers during 12 weeks of out-wintering on fodder beet (■), deferred grazing (▲), or housed for the winter (●), and in the first 12 weeks of lactation.

Table 1. Lactation performance of primiparous Holstein heifers in the first 12 weeks of lactation following out-wintering on fodder beet, deferred grazing, or housed for the winter.

	Fodder beet	Deferred grazing	Housed	s.e.d. ¹	Sig. ¹
Milk, kg	30.1	31.3	30.7	0.34	0.120
Fat, g kg ⁻¹	35.4	37.1	37.9	0.40	0.027
Fat, kg day ⁻¹	1.05	1.16	1.16	0.015	0.006
Protein, g kg ⁻¹	32.1	31.2	31.6	0.17	0.026
Protein, kg day ⁻¹	0.95	0.97	0.96	0.008	0.357
SCC log ₁₀	1.73	1.52	1.66	0.024	0.014

¹ s.e.d. = standard error of difference; Sig. = significance.

(Table 1), although G had lower protein g kg⁻¹ milk than F, with F having lower fat g kg⁻¹ milk than both G and H, and lower SCC observed in G.

Conclusions

High animal performance is achievable from in-calf replacement Holstein dairy heifers outwintered on either fodder beet or deferred perennial ryegrass grazed *in-situ* during the winter in England. Winter performance in these systems is similar to housing with grass silage-based diets, although it may be more difficult to manage Lwt gain and BCS, particularly using deferred grazing. First-lactation milk yield in a high output dairy system was not affected by out-wintering, suggesting these systems can be used as a viable alternative to high capital cost winter housing.

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